

2007 RESEARCH PROBLEM STATEMENT

Problem Title: Retrofitting (slip lining) Culverts and Fish Passage - Phase I

No.: 07.09.05

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Project Champion: Denis Stuhff (co-champions Tim Ularich and Michael Fazio)

(UDOT or FHWA employee who needs this research done, will help the Research Division lead this project, and will spearhead the implementation of the results. If the project gets prioritized at the UTRAC conference, a Champion Commitment Form will be required before funding.)

1. Briefly describe the problem to be addressed.

Many culverts are approaching or are past their original design lives. These 'baby boomer' culverts will need to be repaired, rehabilitated, or replaced. Because entire replacement is so expensive and intrusive, alternate measures to extend the culvert project life are growing increasingly popular. One such method is slip lining, where a 'sleeve' is installed within an existing culvert barrel and stabilized. Plastic pipe sleeves are very popular for slip lining, but the reduced friction within the barrel can create a barrier to fish due to increased water velocities. Hence, mitigation of the increased velocities should go hand-in-hand with slip lined projects where fish passage (present or future) is to be considered. There has been very limited experience in providing for fish passage through slip lined culverts. This is a two-Phase project; this statement provides details of Phase I and a general description of Phase II.

2. Strategic Goal: ☒ Preservation ☒ Operation ☐ Capacity ☐ Safety (check all that apply)

3A. List the research objective(s) to be accomplished:

1. Determine what fish passage measures are currently being used to provide for fish passage in slip lined culverts
2. Visit a limited number of sites to inspect and measure flow characteristics in slip lined culverts retrofitted for fish passage.
3. Perform analyses (no lab work) to establish ranges of hydraulic characteristics of flow that may be expected in slip lined culverts retrofitted for fish passage
4. Determine the range of fish species for which passage may be feasible when retrofitting slip lined culverts for fish passage
5. Prepare for Phase II of the study –laboratory and field tests of actual and potential installations

3B. List the major tasks to accomplish the research objective(s):

Estimated person-hours:

- | | |
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| 1. Contact State Departments of Transportation, State Resource agencies, and conduct literature review | 120 hours |
| 2. Visit limited number of sites to discuss success/failure and to measure flow parameters | 360 hours |
| 3. Using currently available software, perform hydraulic analyses to determine ranges of flow characteristics possible in slip lined culverts retrofitted for fish passage | 400 hours |
| 4. Based on Task 3, determine the ranges of fish species in Utah for which retrofitting slip lined culverts may be feasible | 240 hours |
| 5. Address issues of constructability, durability, sediment retention, and maintenance | 400 hours |
| 6. Prepare reports and establish parameters for physical model testing during Phase II of project | 400 hours |

4. Estimate the cost of this research study including implementation effort (use person-hours from No. 3B): \$142,000 (2 phases)

5. Indicate type of research and/or development project this is

- Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative
☐ Other: _____

(A small project is usually less than \$20,000 and shorter than 6 months)

6. Outline the proposed schedule (when do you need this done, and how will we get there):

The project will require 15 months. Tasks 1 will be completed in 3 months. Tasks 2 and 4 will be completed during a field sampling season. Task 3 will require 5 months, while Task 4 will require 2 months. Four months will be required to prepare for Phase II (laboratory and field testing) and to prepare project reports and presentations.

Phase II of the project will require another 15 months and will include physical model tests of existing and promising mitigation alternatives. A field installation and field monitoring will complement the laboratory work. Cost of Phase II is estimated at \$70,000

7. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University

8A. What deliverables would you like to receive at the end of this project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

Phase I (this proposal): (1) a project report documenting all work; (2) provide broad guidelines for potential implementation in Utah; (3) suggestions for implementation and testing in Utah based upon lessons learned in Utah and elsewhere; (4) guidance for Phase II of the project. Phase II (budget not included in this statement): (1) a project report documenting all work; (2) results from prototype field tests; (3) specific recommendations for retrofit and installation based upon laboratory testing;

8B. Describe how this project will be implemented at UDOT.

After Phase I, several potential design alternatives will have been identified and examined using general hydraulic principles. Phase II will involve installing several of these alternatives in the field and testing them in detail in the laboratory. The lab tests will provide information on the propensity for retrofit designs to retain or evacuate sediments. The field tests will be tested for actual fish passage. At the end of Phase II, specific design procedures will be available based upon both field and lab tests.

Phase II will provide the opportunity to field test several prototype designs identified in Phase I Tasks.

8C. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT will benefit by joining a few other States (Maine, California, and Oregon) in leading the way for providing fish passage for slip lined culverts. The work will be submitted for potential NCHRP project funding in the future. The beneficiaries of both Phases will be UDOT and our traveling public because there will be documented evidence and design procedures that will allow the inevitable slip lining option for culvert rehabilitation to move forward without the threat of considerable loss of fish passage

9. Describe the expected risks and obstacles as well as the strategies to overcome them.

Potential Obstacle

Finding options only available for large salmonids

Poor flow conditions in the field during limited site visits

Overcoming the Potential Obstacle

Use hydraulic principles to scale processes to smaller fish

Coordinate very closely before commitment to field visits are made

10A. List other people (UDOT and non-UDOT) who are willing to participate in the Technical Advisory Committee (TAC) for this study:

<u>Name</u>	<u>Organization / Division / Region</u>	<u>Phone</u>	<u>Email</u>
Paul Abate	USF&WS JSRIP Local Recovery Program Coordinator, Central Utah Water	801-975-3330	paul_abate@fws.gov kris@cuwcd.com
Kris Buelow	Conservancy District	801-226-7132	
Krissy Wilson	Utah Division Wildlife Resources	801 538-4756	krissywilson@utah.gov

10B. Identify other Utah, regional, or national agencies and other groups that may have an interest in supporting this study:

Federal Highway Administration, CUP Completion Office, Utah Department of Natural Resources Species Recovery Program, Utah Reclamation Mitigation and Conservation Commission